Amendments to the Claims

We enclose herewith an amended set of claims and ask that these be substituted for the claims currently on file. The amended claims are based on the claims as filed, but amended to further distinguish from the cited art.

Claims 1-43 Cancelled.

44. (Amended) A method of transmitting a Carrier Interference Multiple Access (CIMA) communication signal comprising generating (14n) a plurality of electromagnetic carrier signals having a plurality of frequencies and modulating (12) the carrier signals with at least one information signal, the method characterized by:

~~phase offsetting (16n) each of the plurality of carrier signals wherein the phase offsets are incremental phase offsets~~ providing the carriers with at least one predetermined phase space (16n), each phase space mapping a data symbol to one of a plurality of pulse waveforms generated from a superposition of the carriers and centered at a predetermined instant in time, the pulse waveforms being positioned substantially orthogonally in time; and

combining (24) the modulated, phase-offset carrier signals into at least one communication channel to generate interference between the modulated, phase-offset carrier signals for providing at least one transmitted CIMA signal having a plurality of multi-frequency carrier-signal components.

45. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ generating (14n) a plurality of electromagnetic carrier signals includes generating a plurality of groups of carriers having identical sets of carrier frequencies, each group being assigned to one of a plurality of users, and ~~the step of phase offsetting (16n) the carriers~~ providing the carriers with at least one predetermined phase space (16n) includes providing a unique relative phase to the carriers of each group to provide each group ~~having~~ with a unique time offset.

46. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ generating (14n) a plurality of electromagnetic carrier signals includes generating a plurality of groups of carriers, each group having a unique set of carrier frequencies and being assigned to at least one user, and ~~the step of phase offsetting (16n) the carriers~~ providing the carriers with at least one predetermined phase space (16n) includes providing a relative phase to each group such that each of a plurality of users may receive constructive superpositions of signals in the same time interval but on different groups of carriers.

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47. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ generating (14n) a plurality of electromagnetic carrier signals is characterized by ~~a step of~~ providing variations to the carrier frequencies with respect to time wherein the frequency variations for each carrier in a group of carriers corresponding to each user are substantially identical.

48. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ modulating (12) the carrier signals comprises a pulse-amplitude modulation being applied to a plurality of the carriers, the pulse-amplitude modulation having a duration that is longer than a constructive-interference signal resulting from a superposition of the carriers, and ~~the step of~~ combining (24) the modulated, phase-offset carrier signals into at least one communication channel ~~being characterized by~~ provides for generating an interference signal between the modulated, phase-offset carrier signals having a duration that is longer than the constructive-interference signal.

49. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ modulating (12) the carrier signals comprises a pulse-amplitude modulation being applied to a plurality of the carriers, the pulse-amplitude modulation having a duration that is shorter than a constructive-interference signal resulting from a superposition of the carriers, and ~~the step of~~ combining (24) the modulated, phase-offset carrier signals into at least one communication channel being

characterized by generating an interference signal between the modulated, phase-offset carrier signals having a duration that is shorter than the constructive-interference signal.

50. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ modulating (12) the carrier signals is performed in at least one predetermined time interval relative to the phase of the carriers, and ~~the step of~~ combining (24) the modulated, phase-offset carrier signals being characterized by generating a signal having modulated carrier-signal components that occupy at least one nonzero-phase space and combine destructively in zero-phase space.

51. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ generating (14n) a plurality of electromagnetic carrier signals ~~being characterized by a step of~~ <u>includes providing the carriers with a tapered</u> ~~tapering a~~ frequency-versus-amplitude window ~~of the carrier signals, and the step of combining (24) the modulated, phase-offset carrier signals being characterized by producing a transmitted CIMA signal having reduced time-domain side-lobe energy~~.

52. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ combining (24) the modulated, phase-offset carrier signals includes coupling the carrier signals into at least one of a set of communication channels, including a waveguide and a free-space channel.

53. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of phase offsetting (16n) the carriers~~ <u>providing the carriers with at least one predetermined phase space (16n)</u> ~~is performed to match~~ <u>matches</u> relative phases between the carriers to a dispersion profile of the carriers in a waveguide such that the dispersion causes the carrier phases to have a predetermined phase relationship after propagating a predetermined distance in the waveguide.

54. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of~~ combining (24) the modulated, phased carrier signals is characterized by coupling the carrier signals from an array of transmitter elements into the channel.

55. (Previously added) The method of transmitting a CIMA communication signal recited in claim 54 wherein each carrier signal associated with a particular user is transmitted from a different transmitter element, resulting in an array beam pattern being generated from a superposition of carrier signals transmitted by each of the transmitter elements.

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56. (Previously added) The method of transmitting a CIMA communication signal recited in claim 54 wherein a separation between the transmitter elements is selected with respect to carrier-frequency separation to control the shape of the array beam pattern and the period in which the array beam pattern scans.

57. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the steps of~~ modulating (12) and phase offsetting (16n) the carriers results in a train of pulses in the time domain modulated with a spread-spectrum code.

58. (Previously added) The method of transmitting a CIMA communication signal recited in claim 57 wherein the spread-spectrum code comprises an information signal and a pseudo-random CDMA spreading code.

59. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of phase offsetting (16n)~~ <u>providing the carriers with at least one predetermined phase space (16n)</u> produces at least two received constructive-interference pulses that overlap in time.

60. (Amended) The method of transmitting a CIMA communication signal recited in claim 44 wherein ~~the step of phase offsetting (16n)~~ <u>providing the carriers with at least</u>

one predetermined phase space (16n) includes a decision step (66) that allows for at least two received constructive-interference pulses to overlap in time when the number of users or channel usage increases beyond a predetermined limit.

61. (Amended) The method of communication recited in claim 60 wherein the decision step (66) includes ~~a step of identifying the users and~~ assigning a priority to each of a plurality of users ~~user that is used~~ to determine which user signals overlap in time.

62. (Amended) In a method of receiving Carrier Interference Multiple Access (CIMA) communication signals comprising receiving (52) at least one transmitted CIMA signal from at least one communication channel to produce a plurality of received multi-frequency carrier-signal components, the improvement comprising:

providing phase-space compensation to the carrier-signal components (60mn), each phase space corresponding to a data symbol mapped onto one of a plurality of pulse waveforms generated from a superposition of carriers and centered at a predetermined instant in time, the pulse waveforms being positioned substantially orthogonally in time, and

combining (62m) the multi-frequency carrier-signal components in phase to generate at least one constructive-interference signal indicative of at least one information signal.

63. (Amended) The method of receiving CIMA communication signals recited in claim 62 wherein ~~the step of combining (62m) the multi-frequency carrier-signal components includes providing~~ providing phase-space compensation to the carriers (60mn) includes providing at least one set of predetermined delays to each set of received carrier-signal components wherein the number of sets of predetermined delays is equal to a number of different phase spaces in which the received CIMA transmit signal is combined.

64. (Amended) The method of receiving CIMA communication signals recited in claim 62 wherein ~~the step of~~ combining (62m) the multi-frequency carrier-signal

components includes providing ~~(60mn) at least one set of predetermined delays to each set of received carrier-signal components to compensate for relative phases between the carriers in order to combine the carrier signals in phase~~ channel compensation to the multi-frequency carrier-signal components.

65. (Amended) The method of receiving CIMA communication signals recited in claim 64 wherein ~~the step of~~ providing (60mn) at least one set of predetermined delays to each set of received carrier-signal components is performed by a frequency-shifted feedback cavity.

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66. (Amended) The method of receiving CIMA communication signals recited in claim 62 wherein ~~the step of~~ combining (62m) the multi-frequency carrier-signal components in phase includes a multi-user detection step (66) in which interfering signals are weighted and combined with at least one intended user signal to cancel contributions of the multi-user interference to each intended user signal.

67. (Amended) A method of communication between at least one transmitter and at least one receiver comprising generating (14n) a plurality of electromagnetic carrier signals, the carrier signals having a plurality of frequencies, and modulating (12) the carrier signals with at least one information signal, the method characterized by:

~~phase offsetting (16n) each of the plurality of carrier signals wherein the phase offsets are incremental phase offsets, and~~ providing the carriers with at least one predetermined phase space (16n), each phase space mapping a data symbol to one of a plurality of pulse waveforms generated from a superposition of the carriers and centered at a predetermined instant in time, the pulse waveforms being positioned substantially orthogonally in time,

combining (24) the modulated, phase-offset carrier signals in at least one communication channel to generate interference between the modulated, phase-offset carrier signals for providing at least one transmitted CIMA signal having a plurality of multi-frequency carrier-signal components,

receiving (52) the at least one transmitted CIMA signal from the at least one communication channel to produce a plurality of received multi-frequency carrier-signal components, ~~the improvement comprising a step of~~ and combining (62m) the multi-frequency carrier-signal components in phase to generate at least one constructive-interference signal indicative of at least one information signal.

68. (Amended) An electromagnetic-wave transmitter comprising a multicarrier generator (14n) capable of generating a plurality of electromagnetic carrier signals having a plurality of frequencies, and a carrier modulator (12) capable of modulating the carrier signals with at least one information signal, the improvement comprising:

~~a delay controller (16n) capable of applying a plurality of incremental phase offsets to the carrier signals for providing the carrier signals with a predetermined phase space at a predetermined time interval~~ a phase-space controller (16n) adapted to provide the carriers with at least one predetermined phase space, each phase space mapping a data symbol to one of a plurality of pulse waveforms generated from a superposition of the carriers and centered at a predetermined instant in time, the pulse waveforms being positioned substantially orthogonally in time, and

an output coupler (24) capable of combining the modulated, phased carriers in at least one communication channel to produce at least one CIMA signal having a plurality of carrier-signal components.

69. (Previously added) The electromagnetic-wave transmitter claimed in Claim 68 wherein the output coupler (24) includes an array of transmitter elements.

70. (Amended) The electromagnetic-wave transmitter claimed in Claim 69 wherein each transmitter element ~~transmits~~ is adapted to transmit a different carrier signal, thereby creating a time-dependent beam pattern.

71. (Amended) The electromagnetic-wave transmitter claimed in Claim 69 wherein each transmitter element ~~transmits~~ is adapted to transmit a different carrier signal for each of a plurality of users, thereby creating a time-dependent beam pattern for each user.

72. (Previously added) The electromagnetic-wave transmitter claimed in Claim 71 further characterized by a multi-frequency controller for controlling the multicarrier generator (14n) to adjust frequency separation of the carriers, thereby controlling the scan rate of each beam pattern.

73. (Previously added) The electromagnetic-wave transmitter claimed in Claim 68 wherein the output coupler (24) includes a coupler to a waveguide.

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74. (Amended) The electromagnetic-wave transmitter claimed in Claim 68 wherein the ~~delay~~ phase-space controller (16n) provides a plurality of incremental phase offsets to carrier signals that are uniformly separated in frequency.

75. (Amended) The electromagnetic-wave transmitter claimed in Claim 68 wherein the delay controller (16n) provides a plurality of incremental phase offsets to carrier signals that ~~are non-uniformly separated in frequency~~ have uniform, but non-adjacent frequency spacing.

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76. (Amended) The electromagnetic-wave transmitter claimed in Claim 68 further characterized by an amplitude-control system (18n) ~~for providing~~ adapted to provide a tapered amplitude window to the carriers to reduce sidelobes.

77. (Amended) The electromagnetic-wave transmitter claimed in Claim 68 wherein the carrier modulator (12) ~~applies~~ is adapted to apply pulse-amplitude modulation to the carrier signals and the output coupler (24) ~~combines~~ is adapted to combine the modulated, phased carriers in the at least one communication channel to produce at least one pulse-amplitude modulated CIMA signal.

78. (Amended) The electromagnetic-wave transmitter claimed in Claim 77 wherein the output coupler (24) ~~combines~~ is adapted to combine the modulated, phased carriers in

the at least one communication channel to produce CIMA signals ~~that occupy at least one nonzero phase space~~.

79. (Amended) The electromagnetic-wave transmitter claimed in Claim 78 wherein the output coupler (24) ~~combines~~ is adapted to combine the modulated, phased carriers in the at least one communication channel to produce at least one CIMA signal whose carriers ~~CIMA signals that~~ combine destructively in a zero-phase space of at least one other CIMA signal.

80. (Amended) The electromagnetic-wave transmitter claimed in Claim 68 wherein the ~~delay~~ phase-space controller (16n) ~~provides~~ is adapted to provide incremental phases to the carriers to match a chromatic dispersion profile of a waveguide for causing a predetermined phase relationship between the carriers to occur at a predetermined distance in the waveguide.

81. (Amended) The electromagnetic-wave transmitter claimed in Claim 68 wherein the ~~delay~~ phase-space controller (16n) ~~provides~~ is adapted to provide a plurality of incremental phases to the carriers to generate a train of pulses, the transmitter further characterized by an amplitude-control system (18n) for providing a predetermined amplitude to each carrier signal to modulate a spread-spectrum code onto the pulse train.

82. (Amended) An electromagnetic-wave receiver having a receiving element (52) capable of receiving transmitted multicarrier signals characterized by information modulated onto at least one phase space from a communication channel for providing at least one set of received multi-frequency carrier-signal components, the improvement comprising:

a combiner (62mn) capable of combining the plurality of received multi-frequency carrier-signal components ~~in phase~~ with respect to the at least one phase space to produce at least one constructive interference signal indicative of at least one information signal.

83. (Amended) The electromagnetic-wave receiver claimed in Claim 82 wherein the receiver further comprises a ~~phase-space delay compensator (60mn)~~ phase-space compensator (60mn) adapted to phase shift the carriers relative to at least one phase space, each phase space corresponding to a data symbol mapped onto one of a plurality of pulse waveforms generated from a superposition of the carriers and centered at a predetermined instant in time, the pulse waveforms being positioned substantially orthogonally in time.

84. (Amended) The electromagnetic-wave receiver claimed in Claim 83 wherein the phase-space ~~delay~~ compensator (60mn) ~~is~~ includes a frequency-shifted feedback cavity.

85. (Amended) The electromagnetic-wave receiver claimed in Claim 83 wherein the phase-space ~~delay~~ compensator (60mn) ~~samples~~ is adapted to sample within at least one predetermined time interval to detect at least one constructive interference signal in at least one zero-phase space.

86. (Amended) The electromagnetic-wave receiver claimed in Claim 85 further comprising a signal estimator (66) ~~that estimates~~ adapted to estimate the at least one information signal from a plurality of samples in a plurality of phase spaces.

87. (Amended) The electromagnetic-wave receiver claimed in Claim 82 further comprising a signal estimator (66) ~~that samples~~ adapted to sample one or more interfering user signals that interfere with an intended user's signal, ~~weights~~ weight the sampled interfering signals, and ~~combines~~ combine the sampled interfering signals with the intended user's signal to cancel multi-user interference.

88. (Amended) The electromagnetic-wave receiver claimed in Claim 82 wherein the combiner (62m) ~~provides~~ is adapted to provide gain adjustment to at least one of the carrier-signal components to compensate for flat fading.

89. (Amended) A carrier-interference multiple-access (CIMA) communication system comprising:

an electromagnetic-wave transmitter comprising a multicarrier generator (14n) capable of generating a plurality of electromagnetic carrier signals having a plurality of frequencies, and a carrier modulator (12) capable of modulating the carrier signals with at least one information signal, the improvement comprising:

~~a delay controller (16n) capable of applying a plurality of incremental phase offsets to the carrier signals for providing the carrier signals with a predetermined phase space at a predetermined time interval~~ a phase-space controller (16n) adapted to provide the carriers with at least one predetermined phase space, each phase space mapping a data symbol to one of a plurality of pulse waveforms generated from a superposition of the carriers and centered at a predetermined instant in time, the pulse waveforms being positioned substantially orthogonally in time, ~~and~~

an output coupler (24) capable of combining the modulated, phased carriers in at least one communication channel to produce at least one CIMA signal having a plurality of carrier-signal components, and

an electromagnetic-wave receiver having a receiving element (52) capable of receiving transmitted signals from a communication channel for providing at least one set of received multi-frequency carrier-signal components, the improvement comprising:

a combiner (62mn) capable of combining the plurality of received multi-frequency carrier-signal components in phase to produce at least one constructive interference signal indicative of at least one information signal.

90. (Amended) In a method for generating at least one spread-spectrum signal having at least one predetermined time-domain characteristic, the method comprising generating a plurality of carrier signals, the improvement comprising:

~~phase offsetting (16n) the carrier signals to generate a predetermined time-domain profile for a superposition of the carrier signals~~ providing the carrier signals with at least one predetermined phase space (16n), each phase space corresponding to at least

one pulse waveform generated from a superposition of the carriers and centered at a predetermined instant in time,

providing ~~(18n)~~ ~~a~~ at least one predetermined gain profile to the carrier signals (18n) to ~~provide the at least one predetermined time-domain characteristic to the superposition of the carrier signals~~ shape the at least one pulse waveform, and

combining (20) the ~~modulated, phase-offset~~ carrier signals to generate the ~~superposition of the carrier signals~~ at least one pulse waveform having the at least one predetermined time-domain characteristic.

91. (Amended) The method for generating at least one spread-spectrum signal claimed in Claim 90 wherein at least one of ~~the steps of phase offsetting~~ providing the carrier signals with at least one predetermined phase space (16n), providing at least one predetermined gain profile to the carrier signals (18n) ~~the gain profile~~, and combining (20) the carrier signals ~~generates~~ is adapted to generate a direct-sequence code division multiple access signal.

92. (Amended) The method for generating at least one spread-spectrum signal claimed in Claim 90 wherein ~~the step of~~ providing at least one predetermined gain profile (18n) ~~the gain profile~~ to the carrier signals includes modulating an information signal onto the carrier signals.

93. (Amended) A spread-spectrum signal generator comprising a multicarrier generator (14n) capable of generating a plurality of electromagnetic carrier signals having a plurality of frequencies, the improvement comprising:

a ~~delay~~ phase-space controller (16n) capable of applying a plurality of incremental phase offsets to the carrier signals for providing the carrier signals with a predetermined phase space at a predetermined time interval,

a gain controller (18n) capable of providing a predetermined gain profile to the carrier signals, and

a combiner (20) capable of combining the modulated, phased carriers to produce a spread spectrum signal from at least one superposition of the carrier signals.

94. (Amended) The spread-spectrum signal generator claimed in Claim 93 wherein the ~~delay~~ <u>phase-space</u> controller (16n) and the gain controller (18n) <u>are adapted to</u> provide phase offsets and a gain profile, respectively, that provides the superposition of the carrier signals with a direct-sequence spread-spectrum signal.

95. (Amended) A method of processing a received multi-carrier signal representing a plurality of symbols and including a plurality of carriers, a subset of said plurality of carriers being allocated to at least one user, the method including:

providing for performing a time domain to frequency domain transform operation on the ~~frequency division multiplexed signal~~ <u>plurality of carriers</u> to generate a frequency-domain signal therefrom;

providing for filtering the frequency-domain signal to remove at least one carrier in said plurality of carriers that are not included in said subset of carriers;

performing a frequency domain to time domain transform operation on the filtered frequency-domain signal to generate a filtered time-domain signal; and

recovering symbols transmitted to the at least one user from the filtered time-domain signal.

96. (Amended) A method of processing at least one received multicarrier signal to generate at least one symbol value, the method including;

providing for performing a channel-compensation operation on the <u>at least one</u> received multicarrier signal; and

providing for mapping values of the multicarrier signal after channel compensation at instants in time used to transmit symbol values.

97. (Previously added) A method of receiving at least one Carrier Interferometry signal including:

providing for selecting a plurality of received carriers within a predetermined bandwidth;

providing for generating at least one pulse waveform from a superposition of the selected carriers; and

providing for estimating at least one information symbol impressed on the at least one of the pulse waveforms.

98. (Amended) A receiver adapted to receive at least one Carrier Interferometry signal including:

a filter adapted to select a predetermined set of received carriers;

a combiner coupled to the filter, the combiner adapted to combine the received carriers to produce at least one signal indicative of a modulated pulse waveform; and

a decision device coupled to the combiner, the decision device adapted to generate at least one estimated data symbol from the ~~combined carriers~~ at least one signal indicative of the modulated pulse waveform.

99. (Amended) A receiver adapted to receive at least one Carrier Interferometry signal including:

a filter adapted to select a predetermined set of received carriers;

a combiner coupled to the filter, the combiner adapted to optimally combine the received carriers in the presence of at least one of interference and multipath to generate at least one signal indicative of a modulated pulse waveform; and

a decision device coupled to the combiner, the decision device adapted to generate at least one estimated data symbol from the ~~combined carriers~~ at least one signal indicative of the modulated pulse waveform.

100. (Amended) An apparatus for receiving a frequency division multiplexed signal representing a plurality of symbols and including a plurality of carriers, a subset of said plurality of carriers being allocated to at least one user, the apparatus including:

a time to frequency domain transform module adapted to generate a frequency-domain signal from the frequency division multiplexed signal;

a filter adapted to filter at least one carrier from the frequency domain signal other than those included in the subset to thereby generate a filtered frequency-domain signal;

a frequency to time domain transform module adapted to perform a frequency domain to time domain transform operation on the filtered frequency-domain signal to thereby generate a time-domain signal; and

a decision module coupled to the frequency to time domain transform module for mapping received signal values at points in time to estimated symbol values.

101. (Previously added) A multicarrier signal receiver adapted to receive at least one multicarrier signal, the receiver including:

a channel-compensation module adapted to perform a channel compensation operation on the multicarrier signal; and

a decision module adapted to map values of the multicarrier signal after channel compensation at instants in time used to transmit symbol values.

102. (Previously added) A method of generating a multicarrier communication signal transmitted by a communication device, the method including:

providing a symbol duration having equally spaced time instants;

allocating a predetermined number of carrier frequencies to the communication device;

receiving as input data, symbols to be transmitted by the multicarrier communication signal;

mapping the data symbols to the equally spaced time instants in the symbol duration to generate a discrete signal of mapped symbols; and

generating a superposition signal by applying a pulse function to the discrete signal, the pulse function operating on the discrete signal such that a frequency response of the superposition signal includes sinusoids having non-zero values at predetermined frequencies and zero values at frequencies other than the predetermined frequencies.

103. (Previously added) A method for generating a multicarrier communication signal having carrier frequencies distributed over a predetermined bandwidth, the method including:

providing for defining a symbol duration for the multicarrier communication signal;

providing for defining a plurality of time instants in the symbol duration;

providing for allocating a set of carrier frequencies from the carrier frequencies distributed over the predetermined bandwidth to a particular communication device;

providing for receiving as input, data symbols from a data source;

providing for mapping the data symbols to the time instants to generate a discrete signal in the time domain; and

providing for generating a superposition signal by applying pulse functions to the discrete signal such that a frequency response of the digital signal sample vector includes sinusoids having non-zero values at allocated carrier frequencies, and zero values at carrier frequencies other than the allocated carrier frequencies.

104. (Previously added) A method of generating Carrier Interferometry signals including:

providing for selecting a plurality of carriers within a predetermined bandwidth;

providing for generating at least one pulse waveform from a superposition of the selected carriers;

providing for accepting at least one information symbol; and

providing for impressing the at least one information symbol on the at least one pulse waveform.

105. (Previously added) A transmitter adapted to generate Carrier Interferometry signals including:

a carrier generator adapted to generate a plurality of carriers within a predetermined bandwidth;

a pulse generator coupled to the carrier generator, the pulse generator adapted to produce at least one pulse waveform from a superposition of selected carriers; and

a modulator coupled to the pulse generator, the modulator adapted to accept at least one information symbol and impress the at least one information symbol onto the at least one pulse waveform.

106. (Previously added) A transmitter adapted to generate Carrier Interferometry signals including:

a pulse generator adapted to produce at least one pulse waveform having a plurality of carrier components; and

a modulator coupled to the pulse generator, the modulator adapted to accept at least one information symbol and impress the at least one information symbol on the at least one pulse waveform.

107. (Previously added) A communication system adapted to generate a multicarrier signal having carrier frequencies distributed over a predetermined bandwidth, the communication system including:

a carrier generator adapted to generate an allocated carrier set selected from carrier frequencies distributed over the predetermined bandwidth;

an interval delay circuit adapted to provide a plurality of information symbols to prescribed time instants in a symbol duration to generate a discrete signal of symbols; and

a pulse-generation circuit adapted to receive the discrete signal and generate a pulse sequence by applying predetermined pulse functions to the discrete signal, the pulse functions operating on the discrete signal such that values of the pulse sequence at the prescribed time instants are equal to the information symbols, and a frequency response of the pulse sequence includes sinusoids having non-zero values at frequencies within the allocated carrier set and zero values at the remaining frequencies.

108. (Previously added) A communication system adapted to generate a multicarrier signal having allocated carrier frequencies distributed over a predetermined bandwidth, the communication system including:

an interval delay circuit adapted to receive a plurality of data symbols and map the symbols to a plurality of prescribed time instants in at least one symbol duration to generate a discrete signal of mapped symbols; and

a pulse generator adapted to receive the discrete signal and generate a pulse train by applying a pulse function to the discrete signal wherein the pulse generator operates on the discrete signal such that a frequency response of the pulse train includes sinusoids having non-zero values at the allocated carrier frequencies, and zero values at frequencies other than the allocated carrier frequencies.

109. (Previously added) A communication system for generating a multicarrier signal having allocated carrier frequencies distributed over a predetermined bandwidth, the communication system including:

an interval delay circuit adapted to receive a plurality of data symbols and map the symbols to a plurality of prescribed time instants in at least one symbol duration to generate a discrete signal of mapped symbols; and

a pulse generator adapted to receive the discrete signal and generate a pulse train by applying a pulse function consisting of a superposition of the allocated carrier frequencies to the discrete signal wherein the pulse function operates on the discrete signal such that values of the pulse train at the prescribed time instants are equal to the mapped symbols.

110. (Amended) A communication system adapted <u>to</u> generate a multicarrier signal having a set of carrier frequencies distributed over a predetermined bandwidth, the communication system including:

a data source adapted to process a plurality of information symbols to generate a set of data symbols with a predetermined set of phase relationships and amplitude profiles to provide a superposition of the carriers with orthogonality in time; and

a Fourier-transform circuit coupled to the data source, the Fourier-transform circuit adapted to perform an inverse Fourier transform of the data symbols to produce a digital time-domain superposition signal <u>characterized by data symbols mapped to orthogonal pulses</u>.

111. (Previously added) In a communication system adapted to generate a multicarrier signal having a set of orthogonal carriers distributed over a predetermined bandwidth, the communication system including a modulator adapted to impress a plurality of data symbols onto the carriers, the communication system further including:

a data source coupled to the modulator, the data source adapted to process a plurality of information symbols to generate the data symbols with a predetermined set of phase relationships and amplitude profiles to provide a superposition of the carriers with orthogonality in time.

112. (New) The method of transmitting a CIMA communication signal recited in claim 44 wherein generating (14n) a plurality of electromagnetic carrier signals having a plurality of frequencies further includes providing for frequency hopping of the carrier signals.

113. (New) The method of receiving CIMA communication signals recited in claim 62 wherein receiving (52) at least one transmitted CIMA signal is adapted to receive at least one transmitted CIMA signal characterized by a plurality of frequency-hopped carrier signals.

114. (New) The method of communication between at least one transmitter and at least one receiver recited in Claim 67 wherein generating (14n) a plurality of electromagnetic carrier signals having a plurality of frequencies further includes providing for frequency hopping of the carrier signals and receiving (52) the at least one transmitted CIMA signal includes providing for receiving a CIMA signal having a plurality of frequency-hopped carrier signals.

115. (New) The electromagnetic-wave transmitter recited in Claim 68 wherein the multicarrier generator (14n) is adapted to generate a plurality of frequency-hopped carrier signals.

116. (New) The electromagnetic-wave receiver recited in Claim 82 wherein the receiving element (52) is adapted to receive transmitted multicarrier frequency-hopped signals.

117. (New) The CIMA communication system recited in Claim 89 wherein the multicarrier generator (14n) is adapted to generate a plurality of frequency-hopped carrier signals and the receiving element (52) is adapted to receive transmitted multicarrier frequency-hopped signals.

118. (New) The method for generating at least one spread-spectrum signal claimed in Claim 90 wherein generating a plurality of carrier signals further includes providing for frequency hopping the carrier signals.

119. (New) The spread-spectrum signal generator claimed in Claim 93 wherein the multicarrier.generator (14n) is adapted to provide for frequency hopping of the plurality of electromagnetic carrier signals.

120. (New) The method of processing a received multi-carrier signal recited in Claim 95 wherein the plurality of carriers include frequency-hopped carriers.

121. (New) The method of processing at least one received multicarrier signal recited in Claim 96 wherein the multicarrier signal includes frequency-hopped carriers.

122. (New) The method of receiving at least one Carrier Interferometry signal recited in Claim 97 wherein providing for selecting a plurality of received carriers includes selecting a plurality of received frequency-hopped carriers.

123. (New) The receiver recited in Claim 98 wherein the filter is adapted to select a predetermined set of received frequency-hopped carriers.

124. (New) The receiver recited in Claim 99 wherein the filter is adapted to select a predetermined set of received frequency-hopped carriers.

125. (New) The apparatus recited in Claim 100 wherein the plurality of carriers includes at least one set of frequency-hopped carriers.

126. (New) The multicarrier signal receiver recited in Claim 101 wherein at least one of the channel-compensation module and the decision module is adapted to process the multicarrier signal wherein the multicarrier signal includes at least one set of frequency-hopped carriers.

127. (New) The method of generating a multicarrier communication signal recited in Claim 102 wherein generating a superposition signal provides the frequency response of the superposition signal with frequency-hopped sinusoids.

128. (New) The method of generating a multicarrier communication signal recited in Claim 103 wherein providing for allocating a set of carrier frequencies is adapted to provide for frequency hopping of the carrier frequencies.

129. (New) The method of generating Carrier Interferometry signals recited in Claim 104 wherein providing for selecting a plurality of carriers further includes providing for frequency hopping of the plurality of carriers.

130. (New) The transmitter recited in Claim 105 wherein the carrier generator is adapted to provide for frequency hopping the plurality of carriers.

131. (New) The transmitter recited in Claim 106 wherein the pulse generator is adapted to provide for frequency hopping the plurality of carrier components.

132. (New) The communication system recited in Claim 107 wherein the pulse-generation circuit is further adapted to provide frequency hopping to the frequency response of the pulse sequence.

133. (New) The communication system recited in Claim 108 further adapted to provide the allocated frequencies with frequency hopping.

134. (New) The communication system recited in Claim 109 wherein the pulse generator is adapted to frequency hop the allocated carrier frequencies.

135. (New) The communication system recited in Claim 110 further adapted to frequency hop the set of carrier frequencies.

136. (New) The communication system recited in Claim 111 further adapted to frequency hop the set of orthogonal carriers.